

SECTION 2: STORMWATER MANAGEMENT REQUIREMENTS

2.1 City of Greensboro Stormwater Master Plans

It is the intent of the City of Greensboro to produce stormwater management master plans that will guide public and private development projects on various quantity and quality aspects of stormwater management for all of the major sub-watersheds in the city. Where such master plans are available and approved by the City Council, site development projects are to conform to the stormwater management guidance and standards available in said master plans.

2.2 Stormwater Management Plan

A Stormwater Management (SWM) Plan is required:

- ⇒ for all new development and redevelopment projects in the corporate limits and extraterritorial jurisdiction of the City, unless otherwise exempt.
- ⇒ to be approved by the City Technical Review Committee prior to site plan or preliminary subdivision plat approval. It is preferred that the SWM Plan be submitted with the site plan or preliminary subdivision plat. For projects located in water-supply watershed areas, a Watershed Development Plan should be incorporated into the Stormwater Management Plan.
- ⇒ to be approved prior to obtaining a grading or building permit
- ⇒ to contain all items in section 2.2.1 below.

Site designers are encouraged to develop *comprehensive SWM plans* for the proposed development, including stormwater quantity and quality controls, non-structural and/or structural improvements, and pollution prevention programs for the site. Any proposed measures which go beyond the requirements of Ordinance Section 27-22 may qualify for credits under the City's Stormwater Utility Fee Crediting Program. In addition, most quantity control facilities provided under the requirements of Section 27-22 should qualify for the fee crediting program, at reduced incentive rates compared to more comprehensive plans.

2.2.1 Stormwater Management/Watershed Development Plan Components

The following information is required on all Stormwater Management (SWM) Plans:

General Information

1. Watershed Location of Proposed Site Development: Note the watershed (i.e., North Buffalo Creek, South Buffalo Creek, Horsepen Creek) and sub-watershed names (i.e., North Buffalo Creek Sub-Watershed 1, North Buffalo Creek Sub-Watershed 2), as applicable, for the

proposed site development. Note water-supply watershed name (i.e., Greensboro Watershed) and water-supply watershed designation (i.e., WS-III, WS-IV, WCA), as applicable.

2. Council-Approved Watershed Master Plan Available? – “Yes” or “No”
3. Show existing built-upon area, if any, and note the amount.
4. Show the proposed built-upon area and note the amount.
5. Note the maximum amount of built-upon area (per watershed development restrictions, stormwater control design, etc.)
6. Show the proposed disturbed (site development) area and note the amount.
7. Note on-site soil type(s) and the hydrologic group(s).
8. Show existing and proposed stormwater conveyance system (pipes, channels, swales, catch basins, etc.) layout and applicable easements. Label pipe size, material, elevations, slopes and structure types (grate inlet, manhole, etc.)
9. Label the amount of off-site drainage area and runoff quantities that discharge onto site.
10. Engineer’s Certification of Stormwater Quantity Control.
11. Engineer’s Certification of Stormwater Quality Control (for high-density development in designated water-supply watershed area).
12. If the site was previously approved or part of a subdivision that was previously approved by the City or County for stormwater management or watershed development, provide the name of the plan and the date that the plan was approved.

Stormwater Management Study – Analysis of Off-site System

13. Map showing the limits of the off-site study. Within the limits the map should show:
 - topography
 - stormwater conveyance system
 - properties and structures adjacent to the conveyance system
 - the total drainage area at the downstream limit of the study (at least 10 times greater than the site development area).
14. Attributes of the off-site stormwater conveyance system including: structure types, materials, slopes, significant elevations, etc.
15. Provide supporting hydrologic and hydraulic calculations.

Stream Buffer and Related Information

16. Show the location of all streams and drainageways that require buffers.
17. Show the buffers and where measured from (that is, top of bank, top of steep slopes adjacent to stream, or edge of wetlands).
18. Label the dimensions and restrictions within the buffer (that is, To Remain Undisturbed, 50% impervious, vegetated, etc.)
19. Show the location of jurisdictional waters and wetlands.*

*The U.S. Army Corps of Engineers and the N.C. Division of Water Quality regulate wetlands and waters of the United States through the 404 Corps Permit and 401 State Water Quality Certification process. The City encourages the protection and enhancement of wetlands and surface waters to promote improved water quality and water quantity management, as well as fish and wildlife biota and habitat preservation, and other benefits to local comprehensive watershed management. *Site designers/developers are responsible for obtaining all applicable Local, State, and Federal permits/certifications/approvals as necessary for proposed site development activities.*

20. Indicate proposed location of proposed stream crossing(s) showing the proposed grading and overall stream impact (includes culvert and outlet protection length). (Alternative analysis may be required by the City to reduce and /or mitigate impacts).

FEMA Regulated Floodway/Floodplain Information

21. Show designated FEMA-regulated floodway and floodplain boundaries on property and note the 100-year Base Flood Elevation (BFE), as applicable.
22. If the site is located within a FEMA Special Flood Hazard Area (SFHA):
 - note the finished floor/floodproofing elevations of all structures.
 - note that no encroachment/development into FEMA-regulated floodway will be made*.
 - If a FEMA-designated Floodway/plain does not exist on the property/parcel, note the nearest distance to a FEMA-designated floodway, if within 2000 feet.

* In general, encroachment into a FEMA-regulated floodway is not permitted unless the developer performs a FEMA No-Rise Certification and/or Conditional/Letter of Map Revision Application and receives approval from the City of Greensboro (Local Floodplain Administrator) and FEMA officials. Questions regarding development procedures within FEMA designated floodplains may be directed to the City's Storm Water Services Division, Technical Support Section.

Low Density General Watershed Development Information

23. Provide completed watershed scoresheet.
24. For each factor where points are claimed, the requirements of that factor must be clearly depicted on the plans (for example, if 20 points for factor 7, “stream buffer along drainageways” are claimed, the plans need to show a 50’ buffer on each side of the creek, the areas to remain wooded, and note the total buffer area amount and the wooded area amount).

Watershed Development in WCA (Watershed Critical Area)

25. Show location of natural slopes greater than 15% which are adjacent to streams and drainageways. These areas and jurisdictional wetlands must remain undisturbed and either dedicated as drainageway and open space or platted as a water quality conservation easement (WQCE).
26. Note that drainage will be provided by means of open vegetated channels.
27. Note the intended land use and SIC Industry Code.
28. Show location of proposed storage tank(s) and indicate material to be stored. A secondary containment system must be constructed for the tank(s) and approved by the City.

Stormwater Control BMP Information

29. Indicate the type(s) of non-structural and/or structural stormwater control best management practices (BMPs) that are proposed.*

*If proposing to use *existing* on-site or off-site controls, provide information to demonstrate that the controls have been approved by the City and can continue to meet quantity/quality control requirements.

30. If proposing to use off-site stormwater controls, indicate the location and owner(s) of the controls and provide information to demonstrate that the property owner will assist in maintaining the controls.
31. If proposing to use a public owned regional stormwater management facility, provide information to demonstrate that the municipality accepts participation from the property owner.
32. Show the location of the proposed stormwater controls and the location of the inlets and outlets to the control.
33. Show and label the access easement to stormwater control from the street R-O-W and the

D.M.U.E. around the facility.

34. Show the approximate size, configuration, and hydraulic structures for the stormwater control/improvement (with calculations).*

**This may be done in lieu of submitting full construction design, details, and calculations for preliminary subdivision plans only. No grading permit will be issued or recordation of any lot can occur until the construction plans have been approved for the stormwater control(s) that handle runoff from that lot. Site plans must include construction drawings for review and approval.*

35. Provide applicable maintenance agreements for proposed stormwater controls.
36. Note: The engineer's certification of completion will be required prior to the final plat or certificate of occupancy. The stormwater control is to be inspected to ensure it is functioning as designed and has full design volume prior to issuance of any certificate of occupancy.
37. Note: The property owner (or homeowner's association) is responsible for maintaining the stormwater control(s) according to the approved maintenance plan and direction of the City of Greensboro.
38. Note: The City of Greensboro and their assigns have right to access the stormwater control(s) for inspections or maintenance, as necessary.

Stormwater Control/Improvement Construction Plans

39. Layout of stormwater control, grading, and significant components (for example, primary outlet structure(s), dam, filter bed depth, bottom drain, etc.).
40. Cross section of proposed SWM improvements showing the elevations of significant components and storage allocations (e.g. sediment storage, peak reduction storage, etc.).
41. Details and material specifications of all significant components of the stormwater control.
42. Provide Engineer's Statement of Pond and Dam Safety (if dam construction is proposed).
43. Provide hydrologic and hydraulic analysis/calculations, water quality and other pertinent calculations for design of the stormwater control.
44. Provide an inspection/maintenance plan for reference by the owner for long-term maintenance needs.
45. Provide the construction sequence for completing the stormwater control.

2.3 Stream Protection Requirements

City Ordinance Sections 27-22 and 30-7 have provisions to help protect and preserve stream channels and floodplains from excessive disturbance and encroachment. The watershed master plans, currently under development, will identify sensitive floodplain areas and may require additional conditions for development and/or buffers within floodplain/ floodprone areas in order to provide protection for citizens from identified existing/future flood risks and/or to meet other objectives within the stakeholder-driven watershed master plans.

2.3.1 Stream Channelization/Piping Restrictions

Generally, no perennial or intermittent stream is to be piped without first obtaining approval from the Technical Review Committee and other applicable city, state and federal permits and certifications. **Perennial streams within a designated water supply watershed and intermittent streams within the Upper and Lower Randleman Lake Watersheds may not be channelized or piped** except where street, driveway and utility crossings and other activities are permitted by the ordinance and are shown to be necessary and impacts are minimized.

2.3.2 Stream Buffers

Stream buffer requirements are summarized in the following tables. Stream buffers are most effective when the buffer remains in an undisturbed state. Therefore, it is encouraged that disturbance be minimized in the entire stream buffer, not just the portion that is required to remain undisturbed. Where the buffer is disturbed, it should be promptly stabilized, re-planting a dense cover of strong rooted grass, plants and trees.

Citywide (excluding Randleman Lake Watershed)

There are four cases within the City, not including the portion of the city inside the Randleman Lake Watershed, where stream buffers are required:

- CASE 1: Drainageways draining an area equal to or larger than 50 acres (non-perennial)
- CASE 2: Perennial streams (as defined by this manual)*
- CASE 3: Perennial streams (on “Watershed Map”, “low density” development)
- CASE 4: Perennial streams (on “Watershed Map”, “high density” development)

*The buffer requirements for Case 2 do not apply to perennial streams that are shown on the “Watershed Map”.

Table 2.1: Stream Buffer Requirements (Cases 1-4)

CASE	MINIMUM WIDTH (each side)	UNDISTURBED	NO BUILT-UPON SURFACE (vegetated)	BUILT-UPON LIMIT OF 50% (no occupied structures allowed)
1	50'	First 15'	N/A	Next 35'
2	50'	First 15'	N/A	Next 35'
3	30'	N/A	Entire 30'	N/A
4	100'	N/A	Entire 100'	N/A

For cases 1 and 2, stream buffers are to be measured from one of the following: (1) the top of the stream bank, or (2) the top of steep slopes adjacent to the stream, or (3) the edge of contiguous wetlands. For cases 3, 4 the stream buffers are to be measured from the top of the stream bank.

Randleman Lake Watershed

The Randleman Lake regulations, including stream buffer requirements, were adopted by the NC Environmental Management Commission in the Spring of 1999 and incorporated into the City's Development Ordinance effective January 1, 2000. The regulations require *riparian* buffers to be maintained on all perennial and intermittent streams in the upper and lower Randleman Lake watersheds. For more information on this buffer requirement including the different zones of the riparian buffer, refer to Ordinance Section 30-7.

Table 2.2: Randleman Lake Watershed Stream Buffer Requirements

STREAM	Density	MINIMUM WIDTH (each side)	ZONE 1	ZONE 2	ZONE 3
Intermittent	Low	50'	First 30'	Next 20'	N/A
	High	50'	First 30'	Next 20'	N/A
Perennial	Low	50'	First 30'	Next 20'	N/A
	High	100'	First 30'	Next 20'	Last 50'

2.4 Stormwater Quality and Quantity Control

Stormwater quality and quantity control are required by Ordinance Sections 30-7 and 27-22. They are required as follows:

1. Stormwater Quality Control (Sec 30-7):

Applicable to high density development in designated water-supply watershed areas.
Required to provide structural control that removes 85% Total Suspended Solids (TSS) from the runoff from the first one (1) inch of rainfall.

2. Stormwater Quantity Control (Sec 27-22):

Applicable to all new development sites within the City that increase the net built-upon area of the site by more than 400 square feet.
Required to minimize off-site flooding, drainage and erosion problems.

The stormwater management (SWM) plan must indicate that these minimum control requirements are met, where applicable. An “ideal site SWM Plan” in most cases is one in which the complete pre-developed stormwater runoff characteristics of the site are maintained in the post-developed conditions, including emulation of the pre-developed runoff hydrographs and pollutant runoff characteristics, and is consistent with an approved watershed master plan. Low-impact developments which incorporate non-structural and/or structural stormwater management practices promote improved urban stormwater management programs and minimize adverse downstream impacts. This concept is increasingly referred to as “sustainable development” from a stormwater and watershed management viewpoint.

2.4.1 Quality Control for High Density Development in Water Supply Watershed Areas (Ordinance Section 30-7)

Section 30-7 requires an “engineered” stormwater quality control to improve the quality of stormwater runoff from new high density development sites. The stormwater quality control must be an acceptable structural BMP as shown in Table 3.2, of this Manual. The requirements and guidelines for designing these BMPs are presented in Section 3.4.

The engineer’s certification of stormwater quality control, which is provided in Table 30-7-1-5 of the City’s Ordinance, is required for proposed high density developments.

2.4.2 Quantity Control (Ordinance Section 27-22)

Section 27-22 requires a hydrologic and hydraulic engineering analysis to evaluate off-site impacts due to increased stormwater runoff from new development and/or redevelopment sites within city limits. Where problems are determined, it is the developer’s responsibility to provide stormwater improvements to minimize the problems.

Site Analysis

1. Evaluate the peak runoff from the property for the pre-development (existing) conditions (Q_1) during a 24-hour rainfall sequence with a recurrence interval of both 2 years and 10 years (where runoff discharges from the property at more than one location, evaluate each location). The 24-hour rainfall sequences for the 2 and 10 year recurrence storms, depth-duration-frequency table, and intensity-duration-frequency table, for the Greensboro area are provided in Appendix C. The rainfall values in the 24-hour rainfall sequence are based on “Type II distribution” (applicable to the Greensboro area, as excerpted from NWS TP-40 and HYDRO-35) of the 24 hour rainfall of 3.5 inches and 5.1 inches for 2- and 10-year recurrence rain storms, respectively.
2. Evaluate the peak runoff from the property for the post-development conditions (Q_2) during a 24-hour rainfall sequence with a recurrence interval of both 2 years and 10 years (where runoff discharges from the property at more than one location, evaluate each location).
3. Evaluate the peak runoff value(s) for post-development conditions (Q_2) and compare that to the pre-development conditions (Q_1) for both the 2-year and 10-year recurrence storms, 24-hour rainfall sequence. If either of the post-development peak flows are greater than the pre-development peak flows, the designer must perform a preliminary and/or detailed hydrologic and hydraulic analysis of the off-site stormwater conveyance system to indicate downstream impacts of any increased stormwater flows to determine if stormwater management improvements are necessary, or provide on-site stormwater control improvements that reduce post-development flows of the 2-year and 10-year recurrence storms, 24- hour rainfall sequence to the pre-development condition, or participate in an approved downstream regional SWM facility, if available.

Off-site Analysis

For new development sites where on-site controls are not provided to reduce post-development flows to pre-development flows, an off-site analysis will be required, unless otherwise exempt. Where on-site quantity controls are provided to reduce post-development flows to pre-development flows, an off-site analysis may generally not be required, provided that conditions in an approved watershed master plan are satisfied. In some cases, however, it is possible that on-site stormwater controls may exacerbate system-wide drainage problems, and thus the designer should verify that the SWM Plan does not create new problems downstream. Therefore, it is recommended that an off-site analysis be performed prior to sizing a quantity control improvement to reduce post-development rates to pre-development rates as the analysis may indicate that different on-site stormwater controls are needed for the given development (other than those developed based on a site-specific analysis only) or that minimal stormwater control measures are required for the site.

Downstream Limits of Analysis: In determining downstream effects from the proposed site development or redevelopment activity, hydrologic and hydraulic engineering studies shall

extend downstream to a point where the proposed site development or redevelopment represents less than ten (10) percent of the total drainage area or watershed. This point is referred to as the “10% point.”

For example, a 5-acre site located near the headwaters of a drainage basin is proposed for sustainable development of which 4 acres are proposed to be disturbed (that is, the runoff will increase on 4 acres of the site after it is developed). The 4 acres drain to one location before discharging from the site. The downstream limit of analysis would be where the contributory watershed equals 40 acres. In general, the area of interest for analysis is the property / site itself, the drainage exit point of the property, and each component (channel, pipe, culvert, overland flow etc.) of the downstream system to the 10% point in the watershed, at a minimum.

Design Storm Events for Analysis: The studies shall be based on an analysis of both 2- and 10-year design storm events.

Analysis Criteria: The analysis should examine whether the design storm events of interest cause or increase flooding, drainage, or erosion problems on off-site property. In determining downstream effects from the proposed development, studies shall extend downstream to the 10% point and should include:

- a) routing of peak flows to the 10% point within the watershed using accepted hydraulic/hydrologic methods described in Section 2.4.3, and
- b) if peak flow calculations indicate that adjacent development(s) might be adversely impacted by the proposed development, then hydraulic step-backwater calculations (Corps of Engineers’ computer models HEC-2 or HEC-RAS are recommended where detailed hydraulic analysis is required) shall be performed and flood elevations determined for the areas impacted. *Detailed hydrologic and hydraulic engineering studies can be costly, thus the Guidance Manual recommends detailed studies only where peak flow hydrograph routing analysis indicates that drainage / flooding problems might be present.*

Land Use Conditions: Hydrologic / hydraulic studies should utilize the following land use conditions for analysis:

- use existing conditions for downstream areas of interest
- for development of watershed hydrographs (off-site drainage areas), existing conditions land use is the minimum requirement, but future land use conditions are recommended for a conservative analysis
- the effects of upstream stormwater detention facilities can be considered in the analysis only if such structures (i.e., regional facilities) have been accepted for maintenance by the City or otherwise approved by the City.

Implementation of Stormwater Control Improvements

Where it is determined that the development of the said site does contribute to flooding, drainage or soil erosion problems at any location between the proposed development site and the 10 percent downstream point then stormwater quantity control improvements must be implemented. Improvements may consist of:

1. On-site peak reduction – The developer may choose to use nonstructural approaches such as natural or engineered swales, depressions in the land and other natural approaches, or structural approaches such as detention structures, extended detention facilities, and alternative Best Management Practices (BMPs) with provisions for stormwater quantity control. *A combination of nonstructural and structural approaches is encouraged.*
2. Off-site peak reduction – The developer may use an off-site publicly or privately owned facility where: the facility is functional (within 2 years for proposed public facilities); the owner/entity has accepted stormwater runoff from the site; it can be demonstrated that the facility is sized to handle the increased flow; the owner has participated and/or implemented a maintenance agreement for use of the facility; it is demonstrated that there are no quantity problems between the site and the off-site facility.
3. Improvements to the downstream stormwater conveyance system – Where it is determined that the best solution is to upgrade the downstream system, this may be done provided that the downstream property owner where the improvements will be made grants a temporary construction easement and the improvement will not cause other problems downstream. The site developer is to coordinate with the City on all proposed downstream improvements.

Design Storm Events: The improvements shall be evaluated based on both 2- and 10-year 24-hour design storm events.

Method for Design: The designer should demonstrate that the proposed improvements are sufficient to minimize downstream problems. Hydraulic/hydrologic methods presented in Section 2.4.3 should be used to evaluate the proposed improvement. An example of an evaluation of a detention facility is provided in Appendix D.

Land Use Conditions: For site specific design of SWM control structures / facilities, use fully developed land use conditions for the site and existing land use conditions for any upstream areas draining to or through the facility (future land use conditions are recommended, however, for a conservative analysis).

Additional Stormwater Management for Public Benefits

Where the Enforcement Officer determines that additional storage capacity in a stormwater management facility beyond that required for on-site stormwater management is necessary in order to enhance or provide for the public health, safety, and general welfare, to correct undesirable existing drainage or flooding conditions or to provide greater protection for future development, the Enforcement Officer may:

1. require that the applicant grant necessary easements over, through or under the applicant's property to provide access to or drainage for such a facility;
2. require that the applicant attempt to obtain from the owners of property where the proposed stormwater management facility is to be located, any easements necessary for the construction and maintenance of same (and failing the acquisition of such easement(s) the City may, at its option, assist in such matter by purchase, condemnation, dedication or otherwise, and subject to item 3 below, with any cost incurred thereby to be paid by the City); and/or
3. participate financially in the construction of such facility or improvement to the extent that such facility or improvement exceeds the required on-site stormwater management determined by the Enforcement Officer.

To implement this provision, both the City and owner/developer must be in agreement with the proposed stormwater management facility that includes additional storage capacity and jointly develop a cost sharing plan which is agreeable to all parties involved.

2.4.3 Hydraulic/Hydrologic Methods

The following hydraulic/hydrologic methods are accepted by the City for use to address quantity and quality requirements.

Hydrologic Methods (hydrograph formulation and peak flow estimation)

- NRCS (Natural Resources Conservation Service, U.S. Department of Agriculture) hydrologic methods (formerly known as the SCS, Soil Conservation Service) are preferred and acceptable for all applications. NRCS methods include those contained in the TR-55 publication and corresponding computer program.
 - The hydrograph formulation methodology presented in Chapter 5 – Tabular Hydrograph method is the preferred method. A summary of this method is given in Appendix D.
 - Runoff flood peaks for small catchment areas or subwatersheds (approximately 50 acres or less) may be determined using the methodology presented in Chapter 4 of

TR-55. However, as pointed out under Limitations in Chapter 4, if a hydrograph is needed or watershed subdivision is required, the Tabular Hydrograph method given in Chapter 5 should be used.

- The NRCS routines applied within the US Army Corps of Engineers computer models HEC-1 and HEC-HMS are preferred and acceptable for most applications. (The Corps of Engineers HEC-1 / HEC-HMS models are preferred over the NRCS TR-20 model, however, since Corps models will be used by the City in watershed modeling and master planning.)
- The Rational Method, $Q_p = C I A$, is acceptable for determining peak runoff from drainage areas of 200 acres or less.
- The “Small Watershed Method” developed by Dr. H.R. Malcom, PE, NC State University, Raleigh, NC, is acceptable for most hydrologic analyses on small watersheds, based on Malcom’s procedures.
- Other hydrologic analysis methods may be allowed if the designer demonstrates that the alternatives are appropriate for the intended purpose.

Detention Storage Estimation Methodologies:

- The Storage-Indication (Puls method) is an acceptable method for routing hydrographs through a reservoir of any size. This method is incorporated into the US Army Corps of Engineers HEC-HMS and NRCS TR-20 computer models.
- The “Chainsaw Routing” method developed by Dr. H.R. Malcom, PE, NC State University, Raleigh, NC, is acceptable for most reservoir routing analyses on small reservoirs, as deemed appropriate by the designer based on Malcom’s procedures. The procedure and an example of an application of this method are given in Appendix D.
- TR-55 (Chapter 6) and Dr. H.R. Malcom’s “Preliminary Design” (given in Appendix E) present methods to give the designer an approximate estimate of the storage required to provide the desired detention. These methods are good for preliminary design, but are to be followed up with an acceptable reservoir routing method for final design.
- Other reservoir routing analysis methods may be allowed if the designer demonstrates that the alternatives are appropriate for the intended purpose.

Hydraulic Methodologies (Open and closed conveyance analysis):

- Where step-backwater hydraulic computations are required for open stream channels including bridges and culvert roadway crossings, the US Army Corps of Engineers HEC-2 or HEC-RAS models are preferred and recommended for most applications. Where significant

closed conduits represent the stormwater conveyance system, EPA's SWMM model is recommended, if a detailed hydraulic analysis is required for development of the SWM Plan.

- For simple hydraulic analyses, where applicable, the Manning's Equation and other hydraulic relationships (e.g., Hydraulic and Energy Grade Line calculations) may be applied where appropriate assumptions for use are satisfied and the results will be conservative.
- Other hydraulic analysis methods may be allowed if the designer demonstrates that the alternatives are appropriate for the intended purpose.

2.4.4 Engineer's Certification Note of Stormwater Quantity Control

For new development plans within the city limits of Greensboro, one of the following certification notes should be made.

1. The development shown on this plan is consistent with the provisions contained on the preliminary plan/site plan _____ (name of plan) _____, which was approved prior to July 1, 1999 and which approval has not lapsed, as specified in Section 30-6-12 of the Greensboro Development Ordinance, and therefore is exempt from compliance with Section 27-22 of the Stormwater Management Ordinance.
2. The net increase in built-upon area is less than 400 square feet, therefore, this development is exempt from subsection (g)(2) "Quantity Control Requirements" of Section 27-22 of the Stormwater Management Ordinance.
3. The stormwater management study included with this plan indicates that there will be no downstream flooding, drainage, or erosion problems as a result of the proposed development between the point where the runoff discharges from the property to where the site development area represents less than 10% of the total drainage area. Therefore, no quantity control improvement is proposed.
4. The stormwater management study included with this plan indicates that there will be downstream flooding, drainage, or erosion problems associated with this development. The proposed stormwater management improvement(s) indicated on this plan is (will be) designed to minimize increased flooding, drainage and erosion problems from occurring between the point where the runoff discharges from the property to where the site development area represents less than 10% of the total drainage area.
5. The stormwater control structure(s) shown on this plan is (will be) designed to reduce the post-development 2-year 24 hour storm event and the 10-year 24 hour storm event to pre-development rates.

2.5 Modifications to Stormwater Requirements

2.5.1 Water-Supply Watershed Protection (Chapter 30)

Ordinance Section 30-9-11, Modifications, describes the procedures for obtaining a modification to the water supply watershed standards of Chapter 30-7.

2.5.2 Stormwater Management Control (Chapter 27)

A modification shall only be granted after a written request is submitted by the applicant to the Enforcement Officer containing, site plan descriptions and drawings, detailed hydrologic and hydraulic engineering analysis and an explanation of the reasons a variance is warranted. The request should clearly indicate that the modification is in general harmony with the general purpose and intent of the Ordinance, and by granting the modification the public safety and welfare have been assured. Separate written modification requests shall be required if there are subsequent additions, expansions, or modifications which would alter the approved stormwater runoff characteristics of a proposed site development or redevelopment activity receiving a modification.

Stream Protection Requirements

A modification to the requirements of Section 27-22 (f) may be granted by the Enforcement Officer if it can be demonstrated that all alternatives to avoid and/or minimize impacts to the stream channel or buffer has been evaluated and proven to be infeasible.

Quantity Control Requirements

A modification to the quantity control requirements of Section 27-22 (g) may be granted by the Enforcement Officer if it can be shown by detailed hydrologic and hydraulic engineering studies and analysis which are acceptable to the Enforcement Officer that one of the following applies:

1. the installation of stormwater management facilities would have insignificant effects on downstream flood peaks; or
2. stormwater management facilities are not needed to protect downstream developments and the downstream drainage system has sufficient capacity to receive any increase in runoff; or
3. it is not necessary to install stormwater management facilities to control developed peak discharge rates at the exit to a proposed development or redevelopment and installing such facilities would increase flood peak discharge rates at some downstream locations; or
4. the Enforcement Officer determines that stormwater management facilities are not needed to control developed peak discharge rates and that installing such facilities would not be in the best public interest.

Quantity control requirements may not be waived if the Enforcement Officer determines that not controlling downstream flood peak discharge rates would increase known flooding or drainage problems, or exceed the capacity of the downstream drainage conveyance system at any point between the exit of a proposed site development or redevelopment and the 10 percent downstream point.